

What is claimed is:

1. A stimulating catheter, comprising:  
a flexible cylindrical tube defining a proximal portion and a distal portion terminating in a distal tip, said tube having a plurality of openings formed therethrough;  
a conductive end cap closing said distal tip; and  
a flexible conductive member attached at one end to said conductive end cap.
2. The catheter of claim 1 wherein said tube has an inner diameter between 0.005 in. (0.127 mm) and 0.025 in. (0.635 mm).
3. The catheter of claim 1 wherein said tube has an outer diameter between 28 gauge and 16 gauge.
4. The catheter of claim 1 wherein said plurality of openings define a diffusion area.
5. The catheter of claim 4 wherein the length of said diffusion area is between 0.5 in. (1.27 cm) and 20 in. (50.8 cm).
6. The catheter of claim 1 having between 2 and 100 openings.
7. The catheter of claim 1 wherein said openings are offset between 0° - 360° circumferentially from adjacent said openings.
8. The catheter of claim 1 wherein said openings are arranged into rows.
9. The catheter of claim 1 wherein said openings are spaced between 2 and 300 mm from adjacent said openings.
10. The catheter of claim 1 further including a window for visualizing flashback.
11. The catheter of claim 1 wherein said flexible cylindrical tube comprises sterilizable plastic.
12. The catheter of claim 11 wherein said sterilizable plastic is selected from the group consisting of polyurethanes, low density polyethylene, high density polyethylene, polypropylene, polystyrene, polycarbonate, polytetrafluoroethylene, tetrafluoroethylene, fluorinated ethylene propylene and polyamides.
13. The catheter of claim 11 wherein said sterilizable plastic comprises polyamide and copolymers thereof.
14. The catheter of claim 11 wherein said sterilizable plastic comprises polyurethane which further includes at least one siloxane.
15. The catheter of claim 1 wherein said flexible conductive member is made from a material selected from the group consisting of stainless steel, titanium, nickel-titanium and conductive plastic filament.
16. The catheter of claim 1 wherein the shape of said flexible conductive member is selected from the group consisting of coil, strip, ribbon, filament, braid or mesh.

17 The catheter of claim 16 wherein said coil is formed of a wire having a diameter of between 0.001 in (0.0254 mm) and 0.003 in (0.0762mm) and having a pitch between 0.009 in (0.2286 mm) and 0.015 in (0.381 mm) between adjacent coils.

18. A catheter, comprising:

a flexible cylindrical tube defining a proximal portion and a distal portion, said tube having a plurality of openings formed therethrough and having a closed end; and

a flexible coil attached to an inside diameter of said tube at said proximal and said distal portions so as to form an annular area between an outside diameter of said coil and said inside diameter of said tube, said coil having adjacent turns spaced to enable fluid to leak into said annular area.

19. The catheter of claim 18 wherein said tube has an inner diameter between 0.005 in. (0.127 mm) and 0.025 in. (0.635 mm).

20. The catheter of claim 18 wherein said tube has an outer diameter between 28 gauge and 16 gauge.

21. The catheter of claim 18 wherein said plurality of openings define a diffusion area.

22. The catheter of claim 21 wherein the length of said diffusion area is between 0.5 in. (1.27 cm) and 20 in. (50.8 cm).

23. The catheter of claim 18 having between 2 and 100 openings.

24. The catheter of claim 18 wherein said openings are offset between 0° - 360° circumferentially from adjacent said openings.

25. The catheter of claim 18 wherein said openings are arranged into rows.

26. The catheter of claim 18 wherein said openings are spaced between 2 and 300 mm from adjacent said openings.

27. The catheter of claim 18 further including a window for visualizing flashback.

28. The catheter of claim 18 wherein said flexible cylindrical tube comprises sterilizable plastic.

29. The catheter of claim 28 wherein said sterilizable plastic is selected from the group consisting of polyurethanes, low density polyethylene, high density polyethylene, polypropylene, polystyrene, polycarbonate, polytetrafluoroethylene, tetrafluoroethylene, fluorinated ethylene propylene and polyamides.

30. The catheter of claim 28 wherein said sterilizable plastic comprises polyamide and copolymers thereof.

31. The catheter of claim 28 wherein said sterilizable plastic comprises polyurethane which further includes at least one siloxane.

32. The catheter of claim 18 wherein said coil is made from a material selected from the group consisting of stainless steel, titanium, nickel-titanium, plastic filament, and conductive plastic filament.

33. The catheter of claim 18 wherein said coil is formed of a wire having a diameter between 0.001 in (0.0254 mm) and 0.003 in (0.0762mm) and having a pitch between 0.009 in (0.2286 mm) and 0.015 in (0.381 mm) between adjacent coils.

34. A catheter, comprising:

a flexible cylindrical tube defining a proximal portion and a distal portion, said tube having a plurality of openings formed therethrough and a distal tip;

a conductive end cap closing said distal tip; and

a flexible conductive coil attached to said conductive end cap and to an inside diameter of said tube at said proximal portion so as to form an annular area between an outside diameter of said coil and said inside diameter of said tube, said coil having adjacent turns spaced to enable fluid to leak into said annular area.

35. The catheter of claim 34 wherein said tube has an inner diameter between 0.005 in. (0.127 mm) and 0.025 in. (0.635 mm).

36. The catheter of claim 34 wherein said tube has an outer diameter between 28 gauge and 16 gauge.

37. The catheter of claim 34 wherein said plurality of openings define a diffusion area.

38. The catheter of claim 37 wherein the length of said diffusion area is between 0.5 in. (1.27 cm) and 20 in. (50.8 cm).

39. The catheter of claim 34 having between 2 and 100 openings.

40. The catheter of claim 34 wherein said openings are offset between 0° - 360° circumferentially from adjacent said openings.

41. The catheter of claim 34 wherein said openings are arranged into rows.

42. The catheter of claim 34 wherein said openings are spaced between 2 and 300 mm from adjacent said openings.

43. The catheter of claim 34 further including a window for visualizing flashback.

44. The catheter of claim 34 wherein said flexible cylindrical tube comprises sterilizable plastic.

45. The catheter of claim 44 wherein said sterilizable plastic is selected from the group consisting of polyurethanes, low density polyethylene, high density polyethylene, polypropylene, polystyrene, polycarbonate, polytetrafluoroethylene, tetrafluoroethylene, fluorinated ethylene propylene and polyamides.

46. The catheter of claim 44 wherein said sterilizable plastic comprises polyamide and copolymers thereof.

47. The catheter of claim 44 wherein said sterilizable plastic comprises polyurethane which further includes at least one siloxane.

48. The catheter of claim 34 wherein said coil is made from a material selected from the group consisting of stainless steel, titanium, nickel-titanium and conductive plastic filament.

49. The catheter of claim 34 wherein said coil is formed of a wire having a diameter between 0.001 in (0.0254 mm) and 0.003 in (0.0762mm) and having a pitch between 0.009 in (0.2286 mm) and 0.015 in (0.381 mm) between adjacent coils.

50. A method for making a catheter, said method comprising:  
connecting a flexible conductive member to a conductive end cap;  
forming a diffusion area in a flexible cylindrical tube, said tube defining a proximal portion and a distal portion terminating in a distal tip;  
surrounding said flexible conductive member with said flexible cylindrical tube such that said conductive end cap closes said distal tip; and  
attaching said flexible conductive member to an inside diameter of the proximal portion of said flexible cylindrical tube such that said flexible conductive member is movable within said flexible cylindrical tube.

51. The method of claim 50 wherein said surrounding includes inserting said flexible conductive member into said flexible tube until a portion of said end cap is also inserted into said flexible tube.

52. The method of claim 50 wherein said surrounding includes inserting said flexible conductive member into said flexible tube until said end cap abuts said distal tip, said method additionally comprising attaching said end cap to said distal tip.

53. The method of claim 52 wherein said attaching includes inserting the distal tip into a heated mold.

54. A system, comprising:  
a catheter comprising: a flexible cylindrical tube defining a proximal portion and a distal portion terminating in a distal tip, said tube having a plurality of openings formed therethrough; a conductive end cap closing said distal tip; and a flexible conductive member attached at one end to said conductive end cap and at another end to said proximal portion so as to be movable within said tube;  
a needle;  
a flexible delivery sheath carrying said catheter;  
an electrical connector; and

a removable stylet, a portion of said stylet being carried within said catheter, an end of said stylet that is opposite to the portion carried within said catheter being connected to said electrical connector.

55. A system, comprising:

a catheter comprising: a flexible cylindrical tube defining a proximal portion and a distal portion, said tube having a plurality of openings formed therethrough and having a closed end; and a flexible coil attached to an inside diameter of said tube at said proximal and said distal portion so as to form an annular area between an outside diameter of said coil and said inside diameter of said tube, said coil having adjacent turns spaced to enable fluid to leak into said annular area;

a needle;

a flexible delivery sheath carrying said catheter;

an electrical connector; and

a removable stylet, a portion of said stylet being carried within said catheter, an end of said stylet that is opposite to the portion carried within said catheter being connected to said electrical connector.

56. A system, comprising:

a catheter comprising: a flexible cylindrical tube defining a proximal portion and a distal portion, said tube having a plurality of openings formed therethrough and a distal tip; a conductive end cap closing said distal tip; and a flexible conductive coil attached to said conductive end cap and to an inside diameter of said tube at said proximal portion so as to form an annular area between an outside diameter of said coil and said inside diameter of said tube, said coil having adjacent turns spaced to enable fluid to leak into said annular area;

a needle;

a flexible delivery sheath carrying said catheter;

an electrical connector; and

a removable stylet, a portion of said stylet being carried within said catheter, an end of said stylet that is opposite to the portion carried within said catheter being connected to said electrical connector.

57. A method of placing a stimulating catheter, comprising:

inserting a needle into a patient;

applying an electrical stimulus to said needle;

feeding a stimulating catheter having a stylet extending thereinto, into said needle, said stylet being in electrical communication with said catheter;

applying an electrical stimulus to said stylet; and

removing said stylet from said catheter.

58. A restimulating device, comprising:  
a stylet; and  
an electrical connector having one end adapted for connection with a source of electrical stimulus and another end connected to said stylet.
59. A method of verifying the placement of a stimulating catheter, comprising:  
inserting a stylet into a catheter through a connector connected to one end of said catheter, said catheter of the type having a conductive member running substantially the length of the catheter; and  
applying an electrical stimulus to said stylet.